BOOK OF
ABSTRACTS

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A low-cost and portable near infrared spectrometer connected to a smartphone for identifying Dalbergia, Diospyros and substitute species in Madagascar

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Abstract: Rosewood and palisander, known as Dalbergia wood, along with ebony from the Diospyros tree, are highly sought-after precious woods from Madagascar. These woods are globally traded and valued, but their overexploitation has led to their scarcity. Therefore, it is crucial for forestry services to possess the capability to identify these wood species as they leave the forest, during transportation, at the point of sale, and prior to export, ensuring only authorized species are exploited. Previous studies have demonstrated the potential of using near infrared (NIR) spectroscopy in laboratories to identify precious wood species through wood samples, yielding promising results. However, utilizing portable NIR devices directly in the field requires addressing perturbations caused by external factors that can affect their performance in wood species identification, such as wood moisture and sample shape. To address these concerns, wood cores were collected from seven Dalbergia species, nine Diospyros species, and six other potential substitute species from Menabe and Masoala forests. Initially, the wood samples were stabilized at different humidity levels to account for the fluctuations in humidity encountered in the field. Subsequently, corrections, including orthogonalization of external parameters (EPO), were applied to the training models. Furthermore, the study investigated the calibration transfer between different NIR instruments to correct for variabilities resulting from instrument changes. Additionally, calibration transfer between different sample types, specifically cores and wood blocks, was considered to ensure field applicability regardless of the wood's shape. Finally, an easy-to-use smartphone application was developed using Userland, Linux, and R software. This application enables easy data acquisition, transfer, and analysis by utilizing a miniature NIR spectrometer connected to the smartphone via Bluetooth. Depending on the species being identified, the discrimination accuracy varies from 70% to 100%. This innovation enables cost-effective and user-friendly application of NIR technology in the field for wood species identification, particularly beneficial in financially limited developing countries.